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60,246-313; 10,857

UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	VanOstrand
Serial No.:	10/760,664
Filed:	1/20/2004
Art Unit:	3744
Examiner:	Tanner, Harry B.
Title:	**Control of Multi-Zone and Multi-Stage HVAC System**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

Appellant submits this Appeal Brief pursuant to the Notice of Appeal filed January 17, 2006. Fees in the amount of $500.00 may be charged to Deposit Account No. 03-0835 in the name of Carrier Corporation. If any additional fees are necessary, you are hereby authorized to charge the same deposit account number.

Real Party in Interest

The real party in interest is Carrier Corporation, the assignee of the present invention.

Related Appeals and Interferences

There are no prior or pending appeals, interferences or judicial proceedings relating to this appeal, or which may directly effect or be directly effected by, or have a bearing on, the Board's decision in this appeal.

Status of Claims

Claims 1-4, 6-13 and 15-17 are pending, rejected and appealed. The examiner has indicated claims 5 and 14 contain allowable subject matter.

Status of Amendments

All amendments have been entered.

Summary of Claimed Invention

Independent claim 1 is directed to a control for an HVAC system. The control (10 – see Figure 1) receives a plurality of zone control signals from a plurality of zones. Zones may be separate rooms within a building that have independent thermostats such that the temperature can be controlled independently between the several zones. A zone control signal might be the difference between a desired temperature and a sensed temperature in the zone. The zone control signal would provide an indication that further cooling or heating is necessary for the particular zone.

Certain heating and cooling equipment (27) has the ability to move between varying levels of capacity, or stages. The present invention claims that the zone control signals are utilized to determine when to change between the stages, or to create a "staging signal" as the term is known in the art. In the prior art, solely the zone control signals were utilized to determine when to switch between stages. Typically, and as shown in Figure 2, at paragraphs 20, 21, 26 and 27 as an example, a stage was changed based upon a zone control signal multiplied by some factor. This resulted in a stage number. At lower stages, this worked well. However, at higher stages, a good deal of temperature difference between a desired temperature and an actual temperature was required to change a stage. This could result in a situation called "droop" wherein the actual temperature in a particular zone was slightly below (e.g., 2°) a desired temperature for a long period of time. This would occur if the stage being utilized was almost, but not quite sufficient to achieve the desired temperature.

The present invention addresses this as set forth in claim 1 by utilizing not only current zone control signals, but at least one prior zone control signal (see paragraphs 23-26). The prior

zone control signals would provide an indication of such a "droop" and thus cause the control to move up in stages.

Claim 3 is dependent to claim 2 which ultimately goes back to claim 1, and sets forth a formula for the staging demand. As set forth in claim 3, the formula for a staging demand is a system demand multiplied by some constant and the sum of a plurality of prior system demands taken over time multiplied by some other constant. As set forth in claim 3, the two constants are distinct.

Dependent claim 4 is dependent to claim 2 and recites that the system demand is calculated by weighting the zone having the greatest absolute value of difference between its set point and its actual temperature. That is, claim 4 requires that the system demand relies more heavily on a zone having a greatest difference in setting a system demand. Claim 2 recites that the zone control signals are utilized to calculate the system demand, which is then in turn utilized to determine a desired staging demand.

Dependent claim 7 is dependent to claim 6 and ultimately goes back to claim 1. Claim 7 requires that a first multiplier is multiplied by current zone control signals and a second multiplier is multiplied by a sum of prior zone control signals taken over time. The two multipliers are recited as being different numbers.

Independent claim 8 is a method claim that roughly tracks the control limitations of claim 1.

Independent claim 10 is an HVAC system claim, and roughly relates to an HVAC system incorporating and utilizing a control as set forth in claim 1.

Dependent claim 12 is dependent ultimately to claim 10 and includes limitations similar to those found in claim 3.

Dependent claim 13 is ultimately dependent to claim 10 and includes limitations similar to those found in dependent claim 4.

Dependent claim 16 is ultimately dependent to claim 10, and includes limitations similar to those found in dependent claim 7.

Grounds of Rejection to be Reviewed on Appeal

Claims 1-4, 6-13 and 15-17 are rejected under 35 USC §103 as being unpatentable over U.S. Patent 5,344,069 to Narikiyo ("Narikiyo") in view of U.S. Patent 5,829,674 to VanOstrand, et al. ("VanOstrand").

Arguments

1. The Rejection of All of the Claims over Narikiyo Taken With VanOstrand is Improper.

The examiner argues that Narikiyo discloses a control for an HVAC system in which a zone demand or load is determined by the difference between the temperature of a zone and the zone set point temperature. The staging of the HVAC system is controlled in response to the total load of all of the zones according to the examiner. The examiner points to column 11, lines 44-53 for this. Ultimately, it is not seen where that portion of column 11 discusses changing a staging demand, however it is not appellant's contention that it has invented the concept of calculating a staging demand signal. To the contrary, Figure 2 in the present application is in fact a representative of the prior art staging demand calculation.

The prior art does not utilize prior zone control demands in calculating its staging signal. The examiner points to VanOstrand which utilizes a proportional integral control.

VanOstrand, however, utilizes this PI control simply as feedback of how a component is approaching a desired position. In the specific example disclosed in VanOstrand, a desired slope for the approach of a temperature in a zone is compared to the actual approach. A damper (the air flow device controlling the amount of air flowing into any one zone) is thus opened or closed to bring the actual slope closer to the desired slope. That is, VanOstrand teaches the conventional use of a PI controller to provide feedback and fine-tuning of an actual system response compared to a desired system response.

What the present invention is doing is quite different. The present invention is determining the desired system response based upon prior signals. The present invention recognizes that with the prior art use of a staging demand that requires higher and higher differences between an actual temperature and a desired temperature, there will be droop. Thus, the present invention factors in prior zone demands into the equation. In this way, the present

invention ensures that any long-lived undesirably low temperature will eventually cause the staging demand to go up.

The examiner does not in any way suggest how the Narikiyo staging demand would be modified to utilize prior signals. Of course, the examiner cannot do so because Narikiyo does not disclose how he determines a staging demand.

Simply, the examiner is relying on hindsight. Notably, in the prior Advisory Action, the examiner has made the statement that PI control is extremely well known, and is probably disclosed in dozens if not hundreds of prior HVAC system patents. Perhaps this is true, however, as mentioned above, these are all feedback type controls that bring an actual system response closer to a desired response. That is not what appellant has disclosed and claimed.

Simply, these two references do not properly meet the claims.

2. The Rejection of Claims 3 and 12 is Improper for Additional Reasons.

These claims require a staging demand formula wherein a system demand is calculated, and a positive constant is multiplied by that system demand, and a sum of a plurality of prior system demands is multiplied by some other positive constant number.

Narikiyo or VanOstrand do not disclose any formula. Simply, these claims are not properly rejected.

3. The Rejection of Claims 4 and 13 is Improper.

Claim 4 requires that the system demand is calculated by weighting the zone having the greatest absolute value of difference between its set point and its actual temperature. In this manner, the zone that most needs additional conditioning is provided with additional weight in the calculation of the staging demand.

Again, this feature finds no response in Narikiyo or VanOstrand.

4. The Rejection of Claims 7 and 16 is Improper.

These claims require that a first multiplier is multiplied by a current zone control signal and a second multiplier, which is different than the first multiplier, is multiplied by a sum of prior zone control signals taken over time. This claim is allowable for reasons similar to that set

forth above with regard to claim 3, however, the claim is broader than claim 3 in not requiring that a system demand be calculated from the zone control signals.

CLOSING

For the reasons set forth above, all claims are allowable. Reversal of the rejections is in order and appellant asks for such a result.

Respectfully submitted,

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Dated: February 15, 2006

CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8

I hereby certify that this correspondence is being facsimile transmitted to the United States patent and Trademark Office, fax number (571) 273-8300, on February 15, 2006.

/Laura Combs

CLAIMS APPENDIX

1. A control for an HVAC system comprising:

a central control for receiving a plurality of zone control signals providing information on a desired temperature and an actual temperature for each of a plurality of zones; and

said central control utilizing a current one of said zone control signals and at least a prior one of said zone control signals to determine a desired staging demand for an associated HVAC system.

2. The control as set forth in claim 1, wherein said zone control signals are utilized to calculate a system demand, and said prior zone control signals are utilized from prior system demands, with said central control utilizing current and prior ones of said system demands to determine said desired staging demand.

3. The control as set forth in claim 2, wherein said staging demand is determined by the following formula:

Staging Demand = x(System Demand) + y(the sum of a plurality of prior System Demands taken over time)

wherein x and y are positive constants.

4. The control as set forth in claim 2, wherein said system demand is calculated by weighting the zone having the greatest absolute value of difference between its set point and its actual temperature .

5. The control as set forth in claim 4, wherein said system demand is calculated by the following formula:

System Demand = [(the sum of demands from zones which have demand) / (the number of zones having demand) + {the greatest zone demand}] / 2

wherein the {} symbols indicate the demand of the zone having the greatest absolute value of demand.

6. The control as set forth in claim 1, wherein said prior zone control signals are taken over a plurality of time periods prior to a point at which said staging demand is determined.

7. The control as set forth in claim 6, wherein a first multiplier is multiplied by said current zone control signals, and a second multiplier is multiplied by a sum of said prior zone control signals taken over a period of time, with said first and second multipliers being different numbers.

8. A method of operating an HVAC system comprising the steps of:

(1) providing a zone control in each of a plurality of zones, each said zone control allowing the setting of a zone set point, and each including a sensor for sensing an actual zone temperature, and sending signals to a central control indicative of the zone set point and the actual zone temperature;

(2) determining a zone demand for each zone in said central control based upon said zone set point, and said actual zone temperature; and

(3) determining a desired stage for an associated HVAC system, said determination being based upon a current value of said zone demand, and prior values of said zone demands.

9. The method as set forth in claim 8, wherein said zone demands are utilized to calculate a system demand based upon said plurality of zone demands.

10. An HVAC system comprising:

an HVAC component for changing the temperature of air in an environment;

ducting to provide air to a plurality of distinct zones from said HVAC component;

a plurality of zone controls each allowing the setting of a zone set point, and each determining an actual zone temperature, said zone controls sending signals to a central control; and

said central control utilizing current ones of said zone control signals, and at least a prior one of said zone control signals to determine a desired staging demand for said HVAC component.

11. The system as set forth in claim 10, wherein said zone control signals are utilized to calculate a system demand, and said prior zone control signals are utilized from prior system demands, with said central control utilizing current and prior ones of said system demands to determine said desired staging demand.

12. The system as set forth in claim 11, wherein said staging demand is determined by the following formula:

Staging Demand = x(System Demand) + y(the sum of a plurality of prior System Demands taken over time)

wherein x and y are positive constants.

13. The system as set forth in claim 11, wherein said system demand is calculated by weighting the zone having the greatest absolute value of difference between its set point and its actual temperature.

14. The system as set forth in claim 13, wherein said system demand is calculated by the following formula:

System Demand = [(the sum of demands from zones which have demand) / (the number of zones having demand) + {the greatest zone demand}] / 2

wherein the { } symbols indicate the demand of the zone having the greatest absolute value of demand.

15. The system as set forth in claim 11, wherein said prior system zone control signals are taken over a plurality of time periods prior to a point at which said staging demand is determined.

16. The system as set forth in claim 15, wherein a first multiplier is multiplied by said current ones of said zone control signals, and a second multiplier is multiplied by a sum of said prior zone control signals taken over a period of time, with said first and second multipliers being different numbers.

17. The system as set forth in claim 16, wherein said zone control signals from each of said plurality of zones are taken together to determine a system demand, and said system demands are utilized by said central control as said current and prior zone control signals.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.